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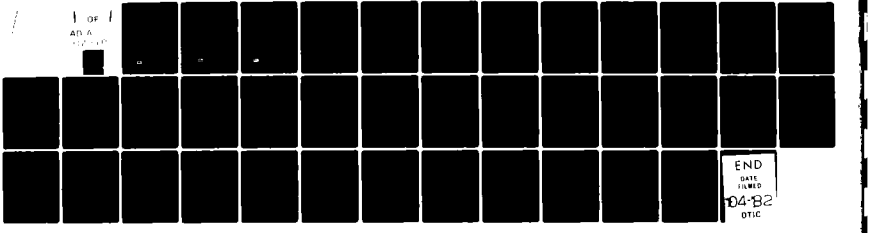

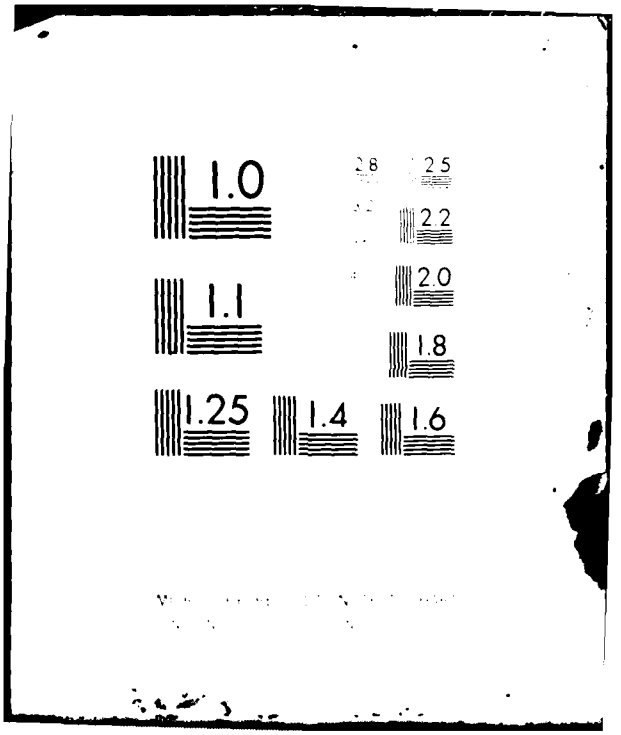
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## SETTING THE SCENE

Military personnel attrition can be divided into two categories, premature and unwanted. Premature attrition refers to losses before the expiration of the first-term of service due to performance and motivational problems. Unwanted attrition refers to losses of trained, qualified personnel who choose not to continue beyond their terms of service due to economic and attitudinal reasons.

The alternative approaches described in this paper for controlling these types of attrition pertain to all of the military services. Specific attrition management programs and models that have proven successful are drawn from Navy experience, but many of them are relevant also to the other services. The paper concludes with a description of what is needed for total attrition management in economically achieving military manpower objectives.

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[1]I am indebted to Drs. Jean W. Fletcher, Philip M. Lurie, James S. Thomason, and John T. Warner for their extensive work that I have reported in this article.

Premature attrition increased sharply in the early years of the peacetime all-volunteer force, and military policy facilitated the discharge of recruits who were substandard performers and motivational roblems. The GAO estimated the costs of premature attrition at over $1 billion per year (reference 1). Although this amount may be subject to debate, it is nevertheless substantial. The GAO estimate includes veteran's benefits and unemployment compensation as well as the costs of recruiting, training, clothing, moving, and separating personnel. The additional costs of unauthorized absences, non-judicial punishments, courts martial, and other administrative and supervisory burdens must also be counted.

Unwanted attrition climbed in the late 1970s as military pay lagged increasingly behind civilian pay. The costs of unwanted attrition also are substantial. They include not only replacement costs, but reduced military readiness and effectiveness. The average experience level of the force declines, remaining experienced personnel are forced to assume additional responsibilities, and span of control is stretched.

Of course, there are trade-offs between attrition and accession in achieving a desired force size and composition. Procurement, training, assignment, retention, and compensation policies certainly interact with one another, but it has been difficult to articulate their relationships

so that the most efficient manpower policy alternatives can be identified. This difficulty stems from lack of data and appropriate models, as well as fiscal and legislative constraints. A few years ago, a Defense Department official estimated that there were nearly 7500 legislative constraints on military compensation and personnel management.

When premature attrition climbed in the early-1970s, the Defense Department took steps to control it by establishing goals for high school graduate and non-graduate attrition within the first three years of service. When extension and reenlistment rates fell in the late 1970s, the Defense Department sought to control them by reallocating available fiscal resources and seeking legislation for additional compensation. These were broad attrition management objectives for WHAT the services were to do. Specific management of attrition - HOW to reduce it - was left to the services, subject to Executive and Congressional approval where necessary.

Generally speaking, personnel policies of a non-pecuniary nature are applied to control premature attrition, while compensation policies are applied to control unwanted subsequent attrition. The structure of military personnel attrition management is diagrammed below.

## MILITARY PERSONNEL ATTRITION MANAGEMENT

| Attrition | Population | Policy | Alternatives |
|---|---|---|---|
| Premature | o Maladjusted | Personnel | Selection |
| | o Marginal performance | (Non-pecuniary) | Intervention |
| | o Disciplinary problems | | Organizational change |
| Unwanted | o Highly-trained | Compensation | Pay |
| | o Leaders | (Pecuniary) | Benefits |

## MANAGING PREMATURE ATTRITION

The Office of the Secretary of Defense and the Office of Naval Research sponsored a conference on first-term enlisted attrition for all of the military services in 1977 (reference 2). Viewpoints on the causes and solutions of premature attrition were presented by the research community in both the government and universities and by military manpower managers, including five flag or general officers. Many of the solutions were adopted and have contributed to recent decreases in premature attrition.

The conference envisioned three major causes of premature attrition: societal, individual, and organizational.

Societal causes refer to the effects of changing cultural values on the military: new life styles, increased mobility, and lesser commitment to institutional values are examples. Selecting recruits who best adapt to the military is a way of getting around this problem, as are substituting women for non-prior-service male recruits and civilianizing military billets. Organizational change, such as a training period without full military benefits, also is a potential solution.

Individual causes of attrition involve unrealistic and incorrect expectations about military life (some conveyed by recruiters and others

due to overly demanding recruits). Better screening for motivation, adjustment, and required literacy can help. Where screening cannot do the job, intervention in the form of more realistic orientation about military life is useful: teaching recruits how to deal with new situations that arise in the service and providing models or guides for appropriate behavior. Rehabilitation or remediation of marginal performers is a further intervention approach.

Organizational causes of attrition center on defective management policies and unit malpractices: outmoded, uneconomical, monolithic policies often buttressed by law and tradition; and variable, situational influences in military units. As a Marine Major once put it, "How come good guys in one unit turn into bad guys in another one?" Selection is not much help here, but intervention in the form of differential training schedules and assignment practices that recognize differences in recruits' aptitudes, abilities, and motives could help. Organizational change is a more direct solution: elimination of the up-or-out policy and identification of more-appropriate incentives for achievement. However, the recruiters, drill sergeants, company commanders, and the like may need training in intervention. These people have the most immediate and frequent influence on recruits, and therefore most affect their behavior.

The conference focused on three main kinds of solutions to premature attrition: selection, intervention, and organizational change.

Selection: The importance of providing realistic job information to recruits and screening for adjustment and motivation was stressed. Peer ratings were pointed out as proven predictors and criteria of success superior to supervisors' ratings, but generally ignored by the military. Alternative supplies of manpower, again, were suggested. There were suggestions for more field studies or demonstrations to test promising selection technologies: they are cheap and can be run at Armed Forces Entrance and Examining Stations (AFEES), recruiting districts, and boot camps.

Intervention: Coping skills, like job skills, ought to be taught. Training schedules adapted to the recruit's needs were recommended, as were recycling and rehabilitation of marginal performers. Since intervention can be costly, however, it should be balanced with the cheaper but limited screening approach.

Organizational Change: Clarification of the military's peacetime role was envisioned as an important goal to justify service. The better matching of people with jobs, including different levels of job difficulty, was advocated. At the same time, limits to job enrichment were recognized. Exploration of the sharp differences in attrition

among military units was recommended, as was research on how to get more mutual commitment from organizations and individuals.

Since the conference, personnel policy initiatives have been taken by the services, and premature attrition has dropped markedly. Defense Department maximum attrition goals for the first 36 months of service are 26 percent for high school graduates and 49 percent for non-graduates who enlisted in FY 1978; goals for FY 1983 are 20 percent and 40 percent. The Navy projects that its FY 1978, 1979, and 1980 recruit cohorts will meet the DoD goals. It has reduced attrition using the following initiatives:

Selection

- o Screening potential recruits on combined factors of education, AFQT, and age that relate to adaptation and survival.
- o Increasing a delayed entry program that allows for completion of civilian educational programs and a better transition into the service.
- o Better matching of recruit abilities and preferences with assignments to technical training schools.

Intervention

- o Academic remediation in boot camp.

- o Behavior skill training to motivate marginal performers and disciplinary problems.
- o Job-oriented basic skill training to quality personnel for technical training.
- o Training brigades to sustain a structured environment, chain of command, and esprit de corps to students in technical training schools.

Organizational Change

- o Leadership and management effectiveness training to provide supervisors with human relations skills.
- o Increased command awareness of and attention to attrition matters.
- o Expanded apprenticeship training (for recruits who do not qualify for technical training and have the highest premature attrition).

Not all initiatives have been successful. An experimental volunteer-out program for men who had completed boot camp, but who did not wish to remain in service, appeared to increase early attrition among high school graduates. A realistic videotape presentation about recruit training had no effect on reducing boot camp attrition.

In general, though, selection, intervention, and organizational changes have been proven to be cost-effective ways to manage premature attrition.

## MODELS OF PREMATURE ATTRITION

The effects of intervention and organizational change on premature attrition often are difficult to estimate quantitatively. However, the selection and assignment of recruits to reduce attrition is a feasible procedure that yields relatively clear-cut results.

### Recruit Screening Developments

Since 1976, the Navy has used a validated applicant screening procedure developed by CNA (reference 3) called SCREEN (for Success Chances of Recruits Entering the Navy). SCREEN relates educational level, AFQT score, and age at enlistment to first-year survival. Similar procedures have been developed by the other services.

The SCREEN procedure first used a grouped logit model to relate applicant characteristics and attrition. Because attrition is a binary variable (stay or leave), the logit model's statistical properties are superior to those of linear models. With advances in statistical and computer technology, a revision of the SCREEN using maximum likelihood

probit estimation with individual data was later introduced (reference 4).

Qualifying scores on the SCREENs were selected by evaluating the benefits derived from lower replacement costs, including the costs of recruiting and training to meet a constant recruit endstrength after one year of service. The SCREEN models required longitudinally tracking a cohort of recruits through a desired period of service. This can be done retrospectively, but the result is still a point-in-time estimate of attrition, e.g., after one year. In 1979, a new model for estimating survival chances, called the Cox regression model, was introduced (reference 5). It can be applied to cross-sectional (and longitudinal) personnel data, and eliminates the need for tracking recruits over time. Advantages of cross-sectional data are that survival patterns are current, and the data need be followed for only a short time. In addition, the Cox model quickly and economically generates a survivial curve, rather than just a point-in-time estimate of survival.

The Cox model was first compared with the probit model on the same data base. The probit model was the standard for comparison, because it had given reasonable results in the past. Separate analyses were performed for recruits who attended technical training schools and those who did not, since the effects of background and service history on attrition differ for these two groups.

The effects on survival for each of the characteristics were estimated at monthly intervals by performing separate probit analyses on recruits who survived the previous month. Pooling these results produced continuous survival curves. The survival curves from the two models were remarkably similar, but the Cox estimates required only a small fraction of the computational time.

The next improvement in screening came from using the Cox model to generate survival curves for technically trained and non-trained recruits through eight years of service (reference 6). The data base consisted of all non-prior-service (NPS) male enlistees in the Navy as of 31 December 1978. These individuals were followed through calendar 1979. All NPS male accessions into the Navy during 1979 were added to the data base. The total population represents approximately half a million men. Since each individual in the population can be traced back to his date of enlistment, entire career survival patterns could be estimated, i.e., survival chances through 30 years of service.

Survival curves through eight years of service were calculated for each combination of educational level, mental group, and age. Since recruits in the data base entered the Navy over a 30-year period, many different selection tests (Armed Forces Qualification Tests and service equivalents) were used in computing mental ability groups. Consequently, to make the various test results comparable, each form was converted to the current FY 1981 service-wide norms.

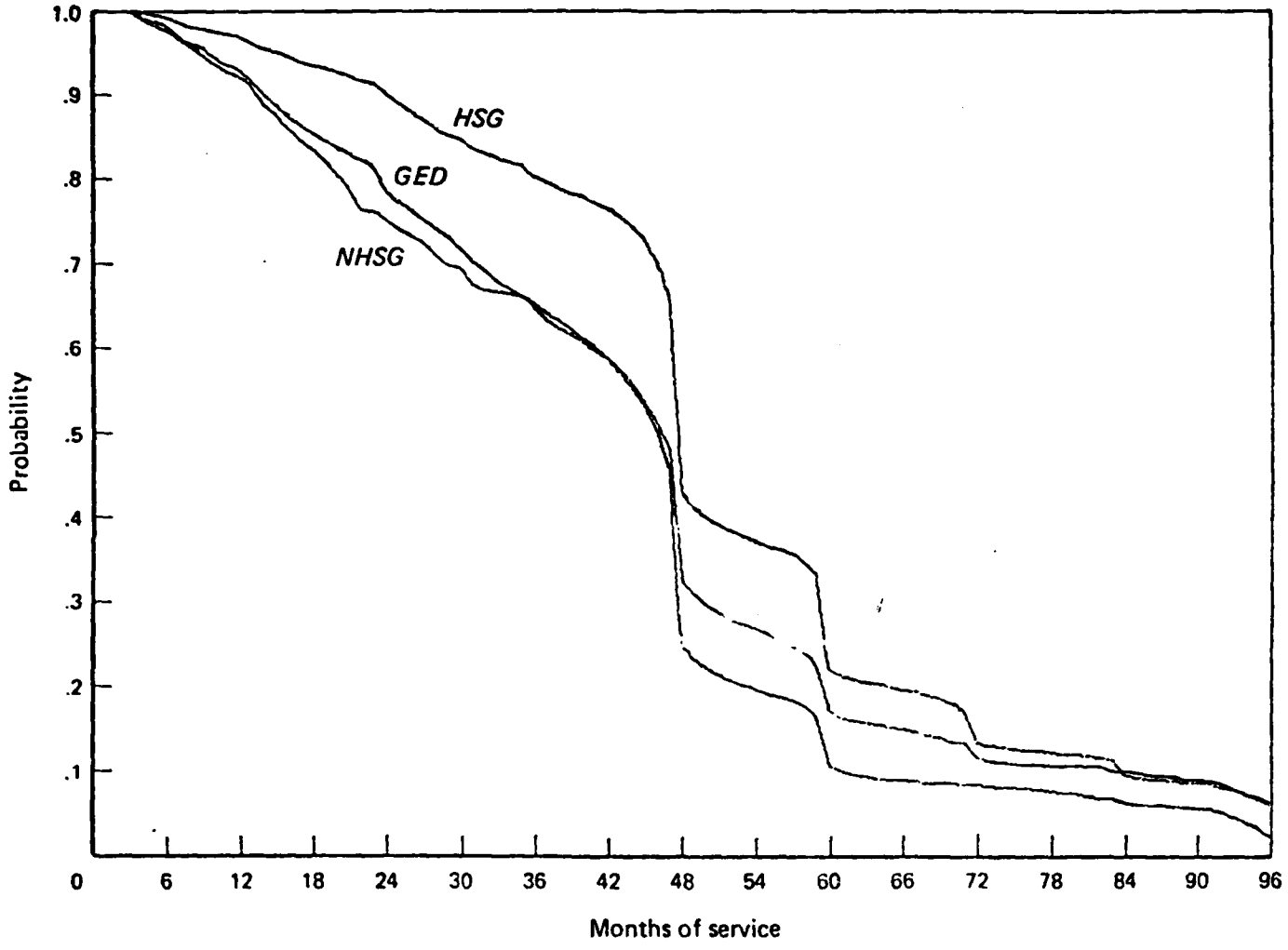
Examples of two-term survival curves for technically trained and non-trained recruits are shown below for high school graduates (HSG), non-graduates (NHSG), and General Educational Development test and other high school equivalents (GED).

These survival curves, though interesting in themselves, are of little help to recruiters in qualifying applicants for enlistment. Therefore, survival was represented by the mean survival time (the area under the survival curve) measured in months. Mean survival time takes more information into account than does a simple point-in-time estimate. If the mean survival time is multiplied by the number of recruits entering the service in a particular year, the expected man-months of survival for that cohort is obtained. Qualifying scores again were computed by the cost/benefit technique used with earlier SCREEN versions.

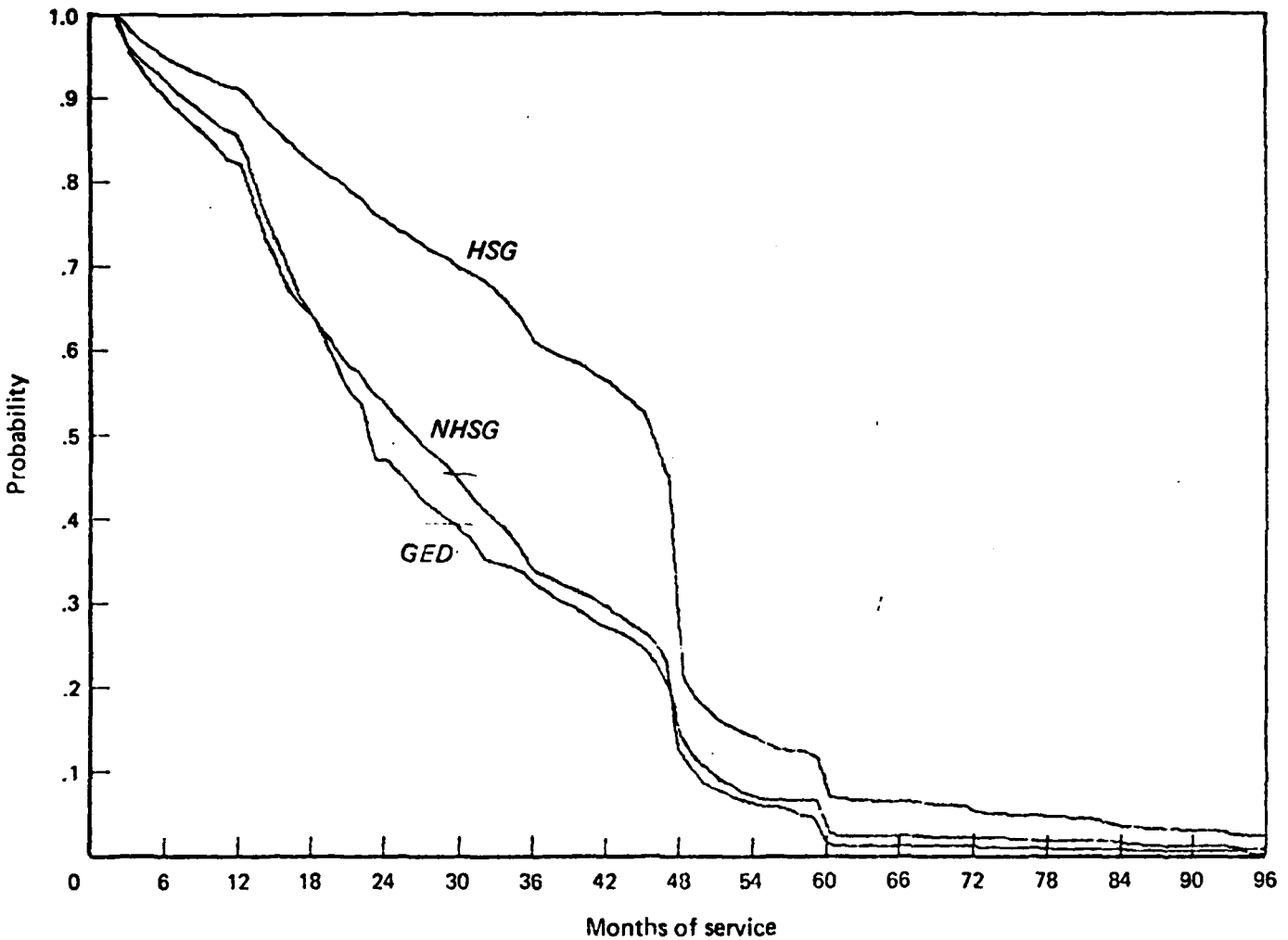
## Rating Assignments To Reduce Premature Attrition

The initial assignments of recruits to Navy ratings have been examined to see if changing them could reduce premature attrition (reference 7).

Four-year survival rates of some 28,000 recruits who joined the Navy in CY 1973 and served in 37 ratings (occupational specialties) were




TWO-TERM SURVIVAL OF TECHNICAL TRAINEES: AGE = 18, MENTAL GROUP = 2




TWO-TERM SURVIVAL OF TRAINEES: AGE = 18, MENTAL GROUP = 3L

estimated. The age, mental ability, education, boot camp, and Delayed Entry Program status of these men were related to their first-term survival using a probit model. The effect of a characteristic on survival often differed by rating. This suggested that a rating assignment procedure that took advantage of such differences could improve the overall survival rate of a whole recruit cohort.

Consequently, a "reassignment" of the recruits was simulated to see if a gain in overall retention could be obtained by exploiting the estimated survival differences across ratings (reference 8). A linear programming computer program was constructed to maximize the number of first-term survivors by optimally reassigning the same 28,000 recruits within the same 37 ratings. The reassignment process was governed by the same constraints the Navy faced in making the actual assignments: the same number and types of recruits, the same number of billets in each rating, and the minimum qualifications for entering each rating. The four-year survival rate achieved through the reassignment procedure was ten percent higher than the actual rate. Further, the distribution of particular characteristics in particular ratings was reasonable.

The next step was a check on the stability of the assignment equations by reestimating them on CY 1974 and 1977 recruit cohorts. At the same time, the investigation was extended to all major ratings available to recruits (reference 9).

Stability of the effects of participation in the Delayed Entry Program, level of education, and age on first-term attrition was demonstrated to differ by rating. The Navy is considering the use of these results in its computerized classification and assignment procedure for recruits.

## MANAGING UNWANTED ATTRITION

The demand for experienced military personnel is based on stated service requirements of varying validity. As of January 1980, the services claimed a shortage of over 100,000 personnel in paygrades E-4 through E-9 (non-commissioned and petty officers) out of a total of about 2.1 million. Unless military operations are affected by career force shortages, it is difficult to determine how critical the shortage of careerists actually is (reference 10). But, there is little doubt that some shortages are real and demonstrable, particularly those in arduous and hazardous billets and where highly trained personnel are in demand in the civilian economy.

Retention study groups in each decade since the 1940s have pointed to inadequate compensation as the main cause of inadequate career retention. In the early years of the all-volunteer force, military compensation was about on a par with civilian compensation. But pay caps and small raises after 1973 prevented military pay from keeping up with civilian pay, which it increasingly lagged, until 1980. The

downward trend in careerist retention paralleled the downward military compensation curve as the 1970s wore on, but rose when Congress finally passed a significant pay package for FY 1981.

The military services now have an elaborate mix of recruiting and retention incentives for first-term and career personnel: different enlistment terms, bonuses, educational benefits, delayed entry, and choices of jobs, units, and locations. On top of all these is the complex military compensation system consisting of pays and benefits:

Pay

- Basic pay.
- Special pay, bonuses, variable housing allowance, proficiency pay, flight pay, submarine pay, sea pay, and the like.
- Allowances for housing and subsistence with their tax advantages.
- Travel allowances for changes of station.

Benefits

- Retirement.
- Veterans Educational Assistance Program (VEAP).
- Medical/dental.
- Life insurance.
- PX and commissary privileges.

- o Family programs.
- o Morale, welfare, and recreational programs.

Other initiatives for managing career attrition include

- o Homebase/home port choices and guaranteed assignments.
- o Location of ship overhaul near home port and decrewing during ship overhaul, an arduous period of shore duty.
- o Lateral transfers.
- o Duty swaps.
- o Spot promotions and meritorious advancements.
- o Homesteading or long-term assignment/basing in a specific geographic area.
- o Human relations management programs to audit and alleviate situational command and unit problems and improve two-way communication.

These and initiatives provide important flexibility to the military. The use of reenlistment bonuses is a prime example of targeted pay to alleviate career personnel shortages.

A recent study of the relationship of attitudes toward pay and Navy life to actual reenlistment behavior in a variety of Navy ratings substantiates the importance of pay to first-term as well as career reenlistees (reference 11). Beyond pay, there are factors related to Navy jobs that are particularly important in the reenlistment decisions

of first-term personnel, and factors related to Navy life - such as duty station, housing, and time away from home - that are particularly important in the reenlistment decisions of careerists

Suggestions for improving the military compensation system include:

- Tying longevity increases to time in grade instead of time in service.
- Increasing pay differential beginning with paygrade E-4.
- Modifying the retirement system to provide benefits before 20 years of service and increase continuation rates after 20 years.
- Targeting raises to jobs with shortages rather than distributing them proportionately across all jobs and paygrades.
- Eliminating the inequity between married and single personnel for the same occupational specialty and paygrade.
- Improving and expanding military housing.
- Improving educational, medical, and dental benefits.

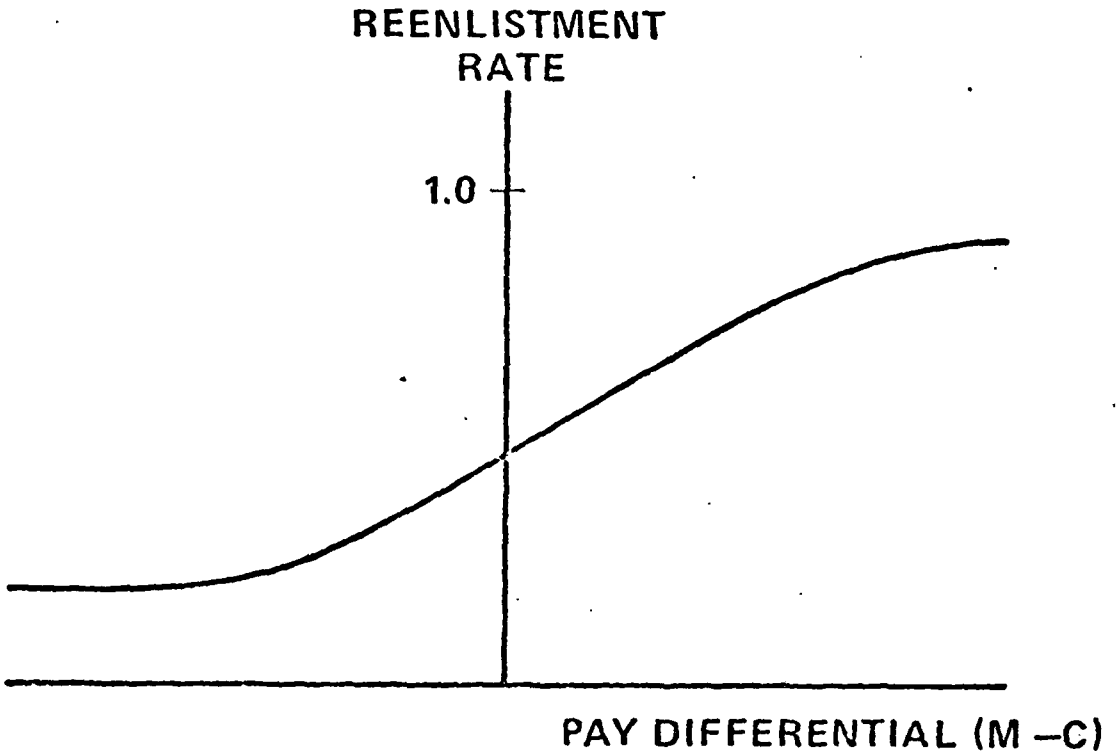
Compensation benefits, however, are expensive - especially so if they are not efficiently applied. Often, as is the case with across-the-board pay raises, they involve paying personnel who otherwise would continue in service without them. Bonuses also have this problem, but only within the military occupational specialty for which they are offered.

In the President's FY 1981 budget, for example, compensation-related appropriations for military personnel consumed about 38 percent of total defense outlays (about $54 out of $143 billion). Of these appropriations, military retired pay alone accounted for 25 percent (about $14 billion).

## MODELING THE EFFECTS OF COMPENSATION ON REENLISTMENT

How can the effects of proposed compensation changes on retention be estimated so that a cost-effective pay package can be chosen? Models of the relationship between compensation and retention have been developed by RAND, CNA, Air Force, and CBO (reference 12). The CNA model has been used by the Navy and the Defense Department to estimate the effects of pays on Navy first- and second-term retention (reference 13).

The CNA model assumes that a person reenlists if he thinks his expected military compensation will outweigh his expected benefits from leaving the service. Thus, the reenlistment rate depends upon the differential between future military and civilian pay streams and preferences for military service. As military pay increases, so does the differential; hence the reenlistment rate should rise as illustrated by the supply curve below. The slope of this supply curve shows how sensitive the reenlistment rate is to changes in military pay. The




REENLISTMENT SUPPLY CURVE

PAY DIFFERENTIAL = M – C

M = ANNUALIZED VALUE OF FUTURE MILITARY PAY

C = ANNUALIZED VALUE OF FUTURE CIVILIAN PAY

steeper is the curve, the more sensitive the reenlistment rate is to pay changes (reference 12).

The CNA model was used to estimate the relationships between bonuses and reenlistments by rating from FY 1974-1978 (reference 14). This involved calculating a military-civilian pay differential and an equation linking it to the reenlistment rate while controlling for education, mental group, and race. The Defense Manpower Data Center provided a longitudinal data file on enlisted men who made first- and second-term reenlistment decisions over FY 1974-78: approximately 220,000 first-termers and 50,000 second-termers.* The data file was sorted into 16 occupational groups on the basis of similarity in training and/or working environment. Then the effects of bonuses on first- and second-term reenlistments, and of first-term bonuses on second-term reenlistments, were estimated.

## First-Term Reenlistments

First-term reenlistment rates were strongly and positively related to the differential between military and civilian pay. However, there was considerable variation by rating. Ratings or occupational groups were categorized according to whether the effects of pay on their

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*The all-Navy second-term reenlistment rate dropped from 70 percent in FY 1974 to 50 percent in FY 1978. In contrast, the first-term rate increased from 32 to 40 percent over the same period.

reenlistment rates are high, medium, or low. A 10 percent raise in pay would induce a 30 percent increase in the reenlistment rate for high-effect ratings, a 20 to 30 percent increase for medium-effect ratings, and a less than 20 percent increase for low-effect ratings.

The high-effect category contained many of the Navy's administrative ratings. In general, these ratings require a smaller pay increase for the same reenlistment effect than do ratings with more arduous working conditions. Exceptions included blue collar construction ratings and aviation mechanics, who have working conditions in the Navy similar to those in the civilian sector. The medium-effect category included all but one of the electronics or electrical equipment repair ratings. The low-effect category contained sea-going ratings with the most arduous working conditions which are also high bonus ratings. With some exceptions, most of the other ratings in the low category were also high-bonus ratings.

## Second-Term Reenlistments

Second-term reenlistment rates were also positively related to the pay differential. With few exceptions, ratings for which pay had a large effect at the first-term reenlistment point also exhibited a large effect at the second-term point. (On average, second-term responses to pay have changed little since the days of the draft.)

The percentage changes in second-term reenlistment rates caused by a 10 percent pay increase were much smaller than they were for first-termers. However, the base reenlistment rates for second-term personnel are about twice as high as those for first-termers. Thus, the absolute change in reenlistments caused by a pay increase appears to be about the same for second-termers as for first-termers.

By how much must the Navy raise pay to meet its second-term reenlistment objectives? The second-term reenlistment rate in FY 1979 was about 45 percent. The objective rate the Navy needs to eliminate its shortfall of experienced personnel is 60 percent. Consequently, an average 15 percent pay raise in enlisted grades E-5 and above is needed to meet the shortfall (higher raises will be needed in some ratings than in others). Such a pay raise would restore real pay levels to where they were at the start of the AVF. But future pay raises must keep up with civilian wage growth or the effect of the raises will be lost.

## First-Term Bonuses and Second-Term Reenlistments

The effects of first-term bonuses on second-term reenlistments were estimated. Higher first-term bonuses may induce those who are less committed to military careers to reenlist, and they would be less likely to reenlist again at the end of their second term. To test this, the first-term bonus multiple (FTBM) for each rating was included as a variable in the second-term reenlistment equation. As expected, the

effects of FTBM in most cases were negative: the higher the FTBM, the lower the second-term reenlistment rate.

Estimates of the percentages of bonus-induced first-term reenlistees who leave at the end of their second term were derived. To make the calculations apply to the same period, the assumption was made that the base second-term reenlistment rate was the FY 1974 rate. This approximates the second-term reenlistment rate of non-bonus-induced individuals. Depending on the rating or occupational group, up to 60 percent of the extra first-term reenlistees induced by higher first-term bonuses left the Navy at the end of their second term.

This evidence of a significant negative relationship between first-term bonuses and second-term reenlistments has important implications for force management and compensation policy, including retirement reform. Current force planning under alternative bonus policies treats retention rates at different terms of service as independent of one another, but the findings show that they are not.

Though higher bonuses at one term of service lead to lower retention rates at future terms, it should not be concluded that bonuses are ineffective. Bonuses are effective in getting more reenlistments. Even though future second-term reenlistment rates may fall because of higher first-term bonuses, more careerists stay past the second-term

point. Finally, bonuses can be targeted at specific communities, so they cost less than general pay raises.

## TOWARD TOTAL ATTRITION MANAGEMENT

The military manpower problem is to economically attract and retain the force needed to man and support the U.S. defense effort. In the past, the services have worked on pieces of this problem: recruiting, training, assignment, rotation, attrition, extension, reenlistment, and compensation. If these pieces could be put together, an integrated framework for evaluating alternative enlisted manpower policies would result. This framework would enable a service to achieve its manpower objectives in a cost-effective manner by setting the values for each of its manpower policies simultaneously. It would take policy interactions into account that are largely ignored today.

To do this, data must be obtained on costs, manpower requirements, and constraints on recruiting, training, and reenlistment or extension policies. Then a model is needed that encompasses these data, a model to evaluate alternative policies for achieving and maintaining a given force. Trade-offs between accession and retention for various manpower quality categories need to be examined. Then, the sensitivity of policies suggested by the framework to changes in costs and constraints must be tested and the feasibility of implementation gauged.

An effort of this nature is currently underway at CNA (reference 15). Its success is not assured, but it is an important step in the direction of total attrition management.

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